**IN THE CLAIMS:**

1. (Withdrawn) A direct methanol fuel cell system comprising:

an anode, a cathode, and a membrane electrolyte disposed between the anode and cathode;

a source of air or oxygen coupled to the cathode;

a source of methanol;

a source of water;

a detector for detecting changes in an output power level of said fuel cell; and

a methanol concentration regulator coupled to the methanol source, detector and anode, said regulator responsive to changes in output power level of said cell for varying the concentration of said methanol at said anode such that cross-over of methanol through said membrane electrolyte is substantially minimized over a dynamic operating range.

2. (Withdrawn) The fuel cell system as in claim 1 wherein said concentration regulator is constructed using microelectromechanical system (MEMS) fabrication techniques.

3. (Withdrawn) The fuel cell system as in claim 2 wherein said concentration regulator comprises a microactuator mechanically coupled to said anode and operable in response to said detector to increase or decrease a flow of methanol to said anode.

4. (Withdrawn) The fuel cell system as in claim 3 wherein said microactuator comprises an enclosed chamber mechanically coupled to a flow plate which supplies methanol to said anode, said chamber being filled with a control liquid in which a resistive element is disposed, said resistive element operable in response to said detector to heat said liquid and thereby exert pressure on said flow plate.

5. (Withdrawn) The fuel cell system as in claim 2 wherein said concentration regulator comprises a microactuator which is integrated with said anode.

6. (Withdrawn) The fuel cell system as in claim 2 wherein said concentration regulator comprises a microactuator mechanically coupled to a gas diffusion layer and operable in response to said detector to increase or decrease a flow of methanol to said anode.

7. (Withdrawn) The fuel cell system as in claim 2 wherein said concentration regulator comprises a microactuator integrated with a gas diffusion layer and operable in response to said detector to increase or decrease a flow of methanol to said anode.

8. (Withdrawn) The fuel cell system as in claim 1 wherein said concentration regulator is constructed using non-MEMS fabrication techniques.

9. (Withdrawn) The fuel cell system as in claim 1 wherein said concentration regulator is constructed using a combination of MEMS and non-MEMS fabrication techniques.

10. (Currently Amended) A method of regulating a concentration of methanol in a direct methanol fuel cell system<u>, the system including a direct methanol fuel cell being used to provide power to an application device,</u> comprising the steps of:
using a detector to sense changes in an output power level of said fuel cell and producing a signal indicative of said changes; and
using said signal to drive a concentration regulator which responsively controls the amount of methanol supplied to said fuel cell's anode in response to changes sensed in said output power level.

11. (Original) The method as in claim 10 wherein said concentration regulator is constructed using MEMS fabrication techniques.

12. (Currently Amended) [[The method as in claim 11 wherein]] A method of regulating a concentration of methanol in a direct methanol fuel cell system, including a direct methanol fuel cell, comprising the steps of:
using a detector to sense changes in an output power level of said fuel cell and producing a signal indicative of said changes; and using said signal to drive a concentration regulator which responsively controls the amount of methanol supplied to said fuel cell's anode ~~in response to changes~~ sensed in said output power level, said concentration regulator [[comprises]] comprising a microactuator mechanically coupled to said anode and operable in response to said detector to increase or decrease a flow of methanol to said anode.

13. (Original) The method as in claim 12 wherein said microactuator comprises an enclosed chamber mechanically coupled to a flow plate which supplies methanol to said anode, said chamber being filled with a control liquid in which a resistive element is disposed, said resistive element operable in response to said detector to heat said liquid and thereby exert pressure on said flow plate, whereby the flow of methanol to said anode is varied.

14. (Currently Amended) The method as in claim [[11]] 12 wherein said concentration regulator comprises a microactuator integrated with said anode.

15. (Currently Amended) The method as in claim [[11]] 12 wherein said concentration regulator comprises a microactuator mechanically coupled to a gas diffusion layer and operable in response to said detector to increase or decrease a flow of methanol to said anode.

16. (Currently Amended) The method as in claim [[11]] 12 wherein said concentration regulator comprises a microactuator integrated with a gas diffusion layer and operable in response to said detector to increase or decrease a flow of methanol to said anode.

17. (Original) The method as in claim 10 wherein said concentration regulator is constructed using non-MEMS fabrication techniques.

18. (Original) The method as in claim 10 wherein said concentration regulator is constructed using a combination of MEMS and non-MEMS fabrication techniques.

19. (Withdrawn) A direct methanol fuel cell system comprising:

an anode, a cathode, and a membrane electrolyte disposed between the anode and cathode;

a source of air or oxygen coupled to the cathode;

a source of methanol;

a source of water; and

a methanol concentration regulator, coupled to the methanol source and anode, responsive to changes in a potential at said anode for varying the concentration of said methanol at said anode such that cross-over of methanol through said membrane electrolyte is substantially minimized over a dynamic operating range.

20. (Withdrawn) The fuel cell system as in claim 19 wherein said concentration regulator is constructed using microelectromechanical system (MEMS) fabrication techniques.

21. (Withdrawn) The fuel cell system as in claim 20 wherein said concentration regulator comprises a microactuator mechanically and electrically coupled to said anode.

22. (Withdrawn) The fuel cell system as in claim 21 wherein said microactuator comprises an enclosed chamber mechanically coupled to a flow plate which supplies

methanol to said anode, said chamber being filled with a control liquid in which a resistive element is disposed, said resistive element operable in response to said detector to heat said liquid and thereby exert pressure on said flow plate.

23. (Withdrawn) The fuel cell system as in claim 20 wherein said concentration regulator comprises a microactuator which is integrated with said anode.

24. (Withdrawn) The fuel cell system as in claim 20 wherein said concentration regulator comprises a microactuator mechanically coupled to a gas diffusion layer and operable in response to said detector to increase or decrease a flow of methanol to said anode.

25. (Withdrawn) The fuel cell system as in claim 20 wherein said concentration regulator comprises a microactuator integrated with a gas diffusion layer and operable in response to said detector to increase or decrease a flow of methanol to said anode.

26. (Withdrawn) The fuel cell system as in claim 19 wherein said concentration regulator is constructed using non-MEMS fabrication techniques.

27. (Withdrawn) The fuel cell system as in claim 19 wherein said concentration regulator is constructed using a combination of MEMS and non-MEMS fabrication techniques.

28. (Currently Amended) A method of regulating a concentration of fuel in a direct oxidation fuel cell system, including a direct oxidation fuel cell being used to provide power to an application device, comprising the steps of:

sensing changes in potential at an anode or load level of said fuel cell system; and

using said sensed changes in potential to drive a concentration regulator which responsively controls the amount of [[methanol]] fuel supplied to said fuel cell's

anode when said power level increases and decreases, thereby minimizing cross-over of [[methanol]] fuel through said fuel cell's membrane electrolyte.

29. (Original) The method as in claim 28 wherein said concentration regulator is constructed using MEMS fabrication techniques.

30. (Currently Amended) [[The method as in claim 29 wherein]] A method of regulating a concentration of fuel in a direct oxidation fuel cell system comprising the steps of:
sensing changes in potential at an anode or load level of said fuel cell system; and using said sensed changes in potential to drive a concentration regulator which responsively controls the amount of fuel supplied to said fuel cell's anode when said power level increases and decreases, thereby minimizing cross-over of fuel through said fuel cell's membrane electrolyte, and said concentration regulator [[comprises]] comprising a microactuator mechanically coupled to said anode and operable in response to said detector to increase or decrease a flow of methanol to said anode.

31. (Original) The method as in claim 30 wherein said microactuator comprises an enclosed chamber mechanically coupled to a flow plate which supplies methanol to said anode, said chamber being filled with a control liquid in which a resistive element is disposed, said resistive element operable in response to said detector to heat said liquid and thereby exert pressure on said flow plate, whereby the flow of methanol to said anode is varied.

32. (Currently Amended) The method as in claim [[28]] 30 wherein said concentration regulator comprises a microactuator integrated with said anode.

33. (Currently Amended) The method as in claim [[28]] 30 wherein said concentration regulator comprises a microactuator mechanically coupled to a gas diffusion layer

and operable in response to said detector to increase or decrease a flow of methanol to said anode.

34. (Currently Amended) The method as in claim [[28]] 30 wherein said concentration regulator comprises a microactuator integrated with a gas diffusion layer and operable in response to said detector to increase or decrease a flow of methanol to said anode.

35. (Original) The method as in claim 28 wherein said concentration regulator is constructed using non-MEMS fabrication techniques.

36. (Original) The method as in claim 28 wherein said concentration regulator is constructed using a combination of MEMS and non-MEMS fabrication techniques.

37. (Previously Presented) The method of regulating a concentration of methanol in a direct methanol fuel cell system, as defined in claim 10, including the further step of

when said detector senses a low output power level of said fuel cell and said concentration regulator indicates a high concentration of methanol, using said signal to drive said concentration regulator to responsively decrease the amount of methanol supplied to said anode thereby substantially minimizing cross-over of methanol through said fuel cell's membrane electrolyte.

38. (Previously Presented) The method of regulating a concentration of methanol in a direct methanol fuel cell system, as defined in claim 10, including the further step of

when said detector senses a high output power level of said fuel cell and said concentration regulator indicates a low concentration of methanol, using said signal to drive said concentration regulator to responsively increase the amount of methanol supplied to

said anode thereby providing optimal methanol concentration while substantially minimizing cross-over of methanol through said fuel cell's membrane electrolyte.

39. (Previously Presented) The method of regulating a concentration of methanol in a direct methanol fuel cell system as defined in claim 28 including the further step of

when a change in said potential of said fuel cell indicates an increase in a high power operating fuel cell, and methanol concentration indicated by said concentration regulator is low, using said signal to drive said concentration regulator to responsively increase the amount of methanol supplied to said fuel cell's anode, to produce an optimal amount of methanol being supplied to said anode, while substantially minimizing methanol crossover.

40. (Previously Presented) The method of regulating a concentration of methanol in a direct methanol fuel cell system as defined in claim 28 including the further step of

when a change in said potential of said fuel cell indicates an increase in a low power operating fuel cell, and methanol concentration indicated by said concentration regulator is high, using said signal to drive said concentration regulator to responsively decrease the amount of methanol supplied to said fuel cell's anode, to substantially minimize methanol crossover.

41. (Withdrawn) A method of regulating a concentration of methanol in a direct methanol fuel cell system comprising the steps of:

providing a diffusion layer disposed between said anode and a source of methanol; and

varying a rate of diffusion of methanol through said diffusion layer, thereby controlling a methanol concentration at said anode.

42. (Withdrawn) The method as in claim 41 wherein said rate of diffusion is varied by compressing or decompressing said diffusion layer.

43. (Withdrawn) The method as in claim 41 wherein said rate of diffusion is varied by changing a porosity of said diffusion layer.

44. (Withdrawn) The method as in claim 41 wherein said rate of diffusion is varied by changing a tortuosity of said diffusion layer.